MEMORANDUM

TO: **UTILITIES ADVISORY COMMISSION**

FROM: **UTILTIES DEPARTMENT**

DATE: **May 2, 2018**

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SUBJECT: **Staff Recommendation that the Utilities Advisory Commission Recommend that Council Accept the Utilities Smart Grid Assessment and Utilities Technology Implementation Plan, Including Advanced Metering Infrastructure-Based Smart Grid Systems to Serve Electricity, Water, and Natural Gas Utility Customers**

RECOMMENDATION

Staff requests that the Utilities Advisory Commission (UAC) recommend that the City Council accept the Utilities Smart Grid Assessment and Utilities Technology Implementation Plan (Utilities Technology Plan), including the timeline and resources for the implementation of an Advanced Metering Infrastructure (AMI)-based smart grid system to more effectively serve electricity, natural gas and water utility customers.

EXECUTIVE SUMMARY

City of Palo Alto Utilities Department (CPAU) staff, along with consultants, developed a strategic technology roadmap over a five-year horizon and identified major critical technology investments such as a replacement for the utilities customer information and billing system (CIS), deployment of AMI, and in coordination with the City's IT department, the implementation of a new citywide enterprise resource planning system (ERP). All of these projects require significant planning, financial and staffing resources and system integration. To ensure a successful AMI deployment, the new CIS system must be stable before integrating with the AMI system. The Utilities Technology Implementation Plan sets out a coordinated implementation approach for these projects.

AMI is a foundational technology that will improve customer experience and enable CPAU to operate more effectively, and is becoming a standard in the utilities industry. An AMI-based smart grid system will empower customers to more efficiently utilize utility supplies, facilitate customer adoption of distributed energy resources (DER) such as solar photovoltaics (PV) and electric vehicles (EV), and enable more efficient detection of water leaks. AMI will also enable CPAU to optimize operations and improve reliability by reducing time to restore outages. Given the large investments required to implement an AMI system, a cost-benefit analysis was undertaken to determine financial viability of AMI, and assess staffing requirements, technological dependencies, project risks, and CPAU's operational readiness.

The consultant found that the overall net-present-value (NPV) of the investment over the 18-year life of the system was close to break-even,[1] considering only the costs and benefits that can be quantified. This effectively means that there will be little or no impact on utility cost to customers over the 18-year life of the project. Upon including non-quantifiable benefits such as enhanced customer experience, improved system reliability, and better distribution asset utilization, the analysis suggests that this strategic investment would be a net benefit to all utility customers, particularly for the electricity and water utility customers. The estimated capital cost related to the AMI system installation is $16 to 18 million[2] with an investment life of 18 years. An additional $1.5 million to $2 million in internal staffing-related costs will also need to be allocated to implement the project. The evaluation also analyzed the operational impact and found that the investment will require a number of staffing changes to implement and maintain the AMI infrastructure to maximize the value of the investment. The annual operating cost of the AMI system is estimated to be $1.9 million, which would be offset by $3.3 million in benefits, resulting in the net benefit of $1.4 million per year on an ongoing basis.

The allocation of the $19 million in initial capital and staffing costs among the three utility funds is expected to be as follows: Electric Fund ($10M), Water Fund ($5.5M) and Gas Fund ($3.5M). The Electric Special Projects (ESP) is available to fund the electric portion of the investment, which eliminates the need for rate changes in the Electric Fund. The Gas and Water Funds will cover the up-front costs from reserves rates, and may consider financing options as well to minimize rate impacts.

Given the favorable results of the cost-benefit analysis, CPAU staff recommends proceeding with AMI and has included the capital costs of the new AMI system in the Electric, Gas, and Water Utility Financial Plans and the Proposed FY 2019 – FY 2023 Capital Budget. Operational costs (consultant costs and staffing requests) needed to begin work on the CIS, ERP, and AMI projects are included in the FY 2019 budget, and additional staffing to continue the project will be included in subsequent year budgets. Staffing and other operational needs in future years are forecasted in the Utilities Technology Implementation Plan and firm proposals will be submitted in future budget years.

[1] See Figure 2. NPV is based on a discount rate of 3.5% over the 18-year life of the project. However, the NPV could range from negative $14.7 million to positive $7.8 million, depending on possible range of outcomes over the life of the project. The NPV value is highly sensitive to operational staffing synergies that could be achieved and customer energy/water conservation that could be spurred by the AMI investments. If such benefits are not achieved, the annual operational savings will diminish, but are still likely to be positive on an annual on-going basis.

[2] This include costs to replace all utility customer electric meters, add radio modules on all existing natural gas and water meters, deploy a mesh network to communicate with the meters, integrate the AMI with CPAU's Customer Information and Billing system (CIS), provide customers with access to hourly utility consumption patterns and enable customers to more efficiently use utility supplies. This investment will also enable CPAU to have visibility into the utility distribution system network to more optimally manage the system. It should be noted that the cost of replacing aging water and gas meters will continue under the ongoing capital improvement project for meter replacement, and is not included under the AMI budget, but efforts will be coordinated with the AMI project.

BACKGROUND

In 2012, City of Palo Alto Utilities (CPAU) completed an assessment of smart grid applications based on AMI for Palo Alto. The study estimated the capital cost associated with AMI implementation for electric, natural gas and water utility services at $15 million to $20 million, and the cost-benefit assessments found the costs outweighed benefits over the 15 year to 20 year life of such an investment. Based on these findings, the study recommended, and City Council approved, deferring major investments in smart grid for several years until technologies mature and implementation costs decline. While deferring the investment, Council also approved a number of pilot scale smart grid projects to evaluate Palo Alto-specific applications (Staff Report 3330, 12/10/2012) at a cost of $0.45M over five years.

In 2013, the Customer Connect pilot project provided electricity, natural gas and water AMI meters to 300 interested single family residential customers and provided time-of-use electric rates to interested customers, including electric vehicle owners. It also provided the capacity to monitor distribution system voltages. The pilot phase of the program ended in 2017 but staff is planning to maintain the program for current participants until full AMI deployment. A report summarizing the lessons learned and findings from the pilot was discussed with the UAC (UAC Report dated 09/06/2017). During the five year period, staff has also extensively engaged with other utilities that have deployed AMI and learned from their experiences. A CPAU staff team, with cross divisional participation, has also closely collaborated with industry experts and stakeholders to learn about the smart grid technologies and their applications in Palo Alto.[3] To implement many of these applications, Palo Alto would need the foundational AMI system in place.

DISCUSSION

In May 2017, CPAU retained Utiliworks Consulting (UWC) as consultants to re-evaluate the cost and benefits associated with AMI investments and to develop an overarching technology roadmap including an implementation plan (Staff Report 7836, 5/8/2017). The Smart Grid Assessment & Utilities Technology Plan (Attachment A) is the result of the consultant's efforts. The positive cost-benefit assessment presented in the plan is guiding staff's recommendation to proceed with AMI investments and the roadmap in the plan will roughly guide staff's activities and proposals to Council over the next five years. Staff is asking the UAC to recommend that Council accept this report and approve its use as a high-level roadmap for AMI-related activities over the next five years, with the understanding that various parts of the plan (such as budgets and staffing actions) would require separate and additional approval by Council at the appropriate time, with modification as needed. The financial and staffing impacts are summarized in the Resource Impact section.

[3] Palo Alto is a member of Smart Electric Power Association, NCPA Smart Grid Group, Bay Area Water AMI Group, California Electric Transportation Coalition, Building Decarbonization Working group; and participates in forums hosted by EPRI, Emerging Technology Coordinating Council, CEC/EPIC forum, California Energy Storage Alliance, and regional conferences. Through CPAU's Emerging Technology program and engagement through Stanford, staff also engages with technology vendors to find suitable opportunities for Palo Alto.

The content of the report is summarized in the following sections:

A. Components of AMI Technology and Associated Capital Investment Cost
B. AMI System Operating Benefits
C. AMI System Operating Cost
D. Summary of Cost-Benefit Analysis & Sensitivity Analysis of AMI Investment
E. Policies and Procedures to Implement and Operate AMI based Utility System
F. Coordinated Implementation with Technology Projects – Technology Roadmap
G. Change Management & Staffing Resource Needs
H. Community and UAC Input
I. AMI Project Implementation/Operating Risks and Risk Mitigation Strategies

A. Components of AMI Technology and Associated Capital Investment Cost

Implementation of an AMI-based smart grid system will require a number of major components. These major components and their related costs are tabulated below. The total cost of the project is estimated at $18 million to $19 million, which includes costs related to equipment and software purchases, systems integration, contract services and internal staffing requirements. Table 1 lists these cost categories. All of these costs are included in the FY 2019 Proposed Capital Budget that extends through FY 2023.

Table 1: Components of AMI Investment Cost (Equipment, Services, Staffing to Implement)

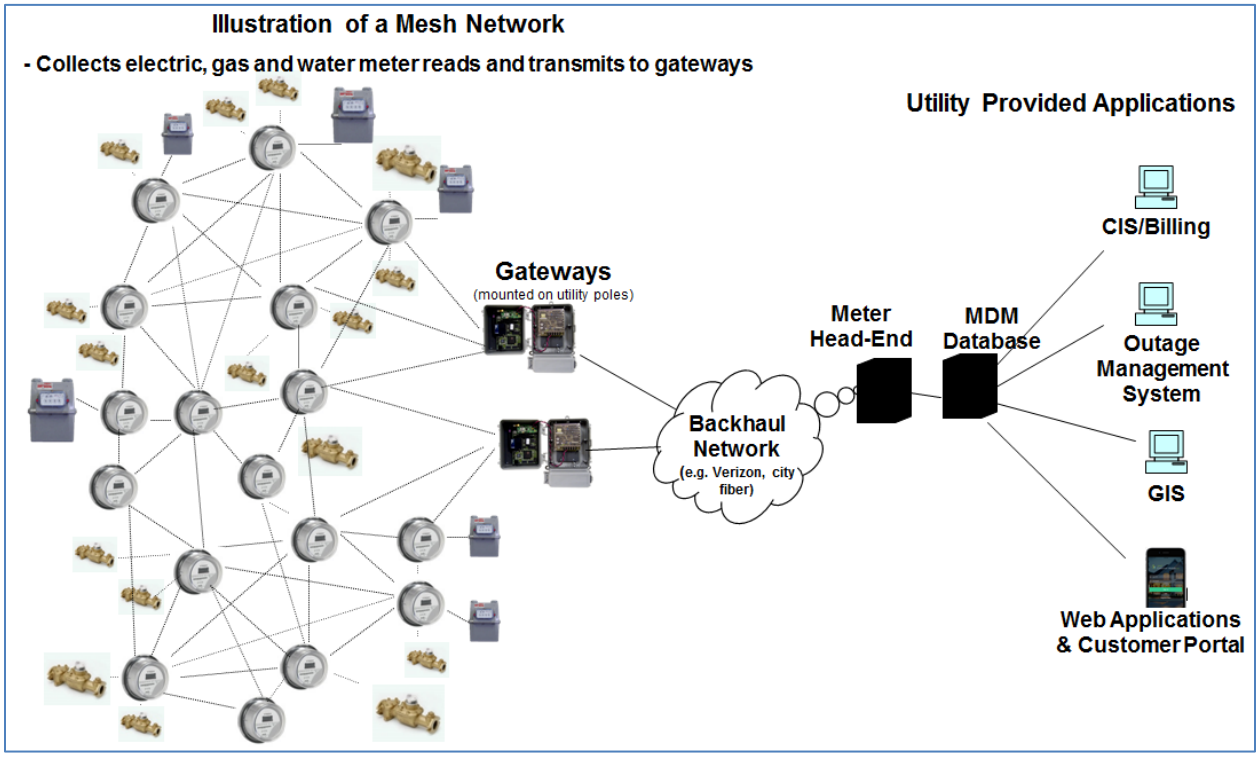
AMI Components	Purpose	Cost ($M)
Electric Meters & Installation	To record electricity consumption and voltage at customer premises every 15 minutes and make consumption information available to customers the next day.[4]	$5.5
Radios, dials & installation to mount on existing water meters	To record water meter consumption every hour and make consumption information available to customers the next day.	$4.2
Radios & installation to mount on existing gas meters	To record gas meter consumption every hour and make consumption information available to customers the next day.	$2.3
Mesh network radios and meter head-end database	Mesh radios to receive and transmit meter readings to the head-end database for storage	$0.7
Meter data management System (MDMS) & Integration with billing and customer portal	MDMS validates the 15-min interval consumption and voltage reads, estimates missing interval reads through a validation process, and stores the information in a database for utility billing and display on customer web portal	$2.7
Meter Installation Services	Approximately 73,000 meters and/or radios will be installed and provisioned by third party installers	$0.4

[4] Real time reads could be made available to customer via the meter's Zigbee wireless radio, if customer owns a compatible in-home-display (IHD).

Project management and software integration services	Professional AMI project management consultants would be hired to oversee software integration/testing and coordinate the implementation of the project	$0.9
TOTAL COST OF EQUIPMENT AND PROJECT IMPLEMENTATION SERVICES		**$16.7**
Internal CPAU staffing Cost	3-4 FTE staff needed over the 2-3 year period to plan and implement the project	$1.5M to $2M
ESTIMATED TOTAL PROJECT COST		**$18M to $19M**

The equipment and software components of the AMI system and their interfaces with the Meter Data Management (MDM) and CIS systems are illustrated in Figure 1.

Figure 1: Illustration of AMI Mesh Network, MDM System, Interface with CIS/Billing System



B. AMI System Operating Benefits

Electric distribution systems are transitioning away from their original purpose of delivering energy from the utility to the customer. The new distribution system is evolving into a complex network that will allow integration of widely distributed energy generation, storage, and energy management systems owned by customers. The widespread adoption of DER systems[5] by

[5] DERs are defined as distributed renewable generation resources such as solar photovoltaics (PV), energy efficiency (EE), energy storage (ES), electric vehicles (EV), and demand response (DR) technologies. The emphasis on customer DER adoption from the State level is because DERs as key enabling technologies to both lower greenhouse gas emissions (GHG) and to help electric grid reliability with increased penetration of intermittent

electricity consumers and the increasing reliance on intermittent renewable electric supply resources to lower greenhouse gases associated with the state's electric supply are fundamentally transforming the way electric utilities operate. These changes will require the utility to implement time-dependent electric customer rates, provide more timely and relevant information to customer about electric consumption patterns, and to gain greater visibility of the electricity flows in the distribution system for reliable utility operations.

In addition to meeting these needs of the electric customer and utility, an AMI system could also provide greater visibility of water and natural gas usage for customers. AMI sensors will enable faster detection and repair of water leaks, and provide tools for CPAU and customers to implement additional customer energy efficiency and conservation initiatives. If customers opt to participate in these initiatives, the commensurate reduction in consumption will lower CPAU's costs to purchase electricity, natural gas and water supplies. Voltage sensing on the electric distribution feeders is estimated to result in 0.5% Conservation Voltage Reduction (CVR) related energy saving. Table 2 provides an estimate of AMI-related conservation savings based on estimates of customer participation after 5 years of AMI implementation.

AMI will also largely eliminate the need for manual meter reading function[6]. The new technology will also largely eliminate the need for manual 'check-reads' currently undertaken in the event the manual read is incorrectly entered into the handheld meter reading device. The total AMI related operating benefits are estimated at $3.3 million/year in year 5 after installation.

renewable energy supplies. Locally, CPAU considers energy efficiency and demand reduction as the highest priority resource and Palo Alto's Sustainability and Climate Action Plan (S/CAP) also identified several DERs as key technologies for achieving the community's greenhouse gas (GHG) emission reduction goals, particularly EVs, high-efficiency heat-pump water heaters (HPWH), and heat-pump space heaters (HPSH) which displace fossil fuel combustion.

[6] CPAU is engaged with meter reading staff for them to train and transition to other roles with the City in the 2022 timeline.

Table 2: Listing of AMI Related Operating Benefit Estimates ($3.3 million/year)

Cost Category	Key Assumptions(s)	Annual Benefit (M$)
Meter Reading		
Subtotal	**95% reduction on staffing load**	**$ 1.26**
Customer Service & Field Service Operations		
Subtotal	**12.7% reduction on staffing load**	**$ 0.35**
CVR Savings & Operations		
Subtotal	**0.5% CVR savings**	**$ 0.47**
Improved Meter Accuracy		
Subtotal		**$ -**
Customer Conservation Savings & Avoided Purchase Cost		
Electric Conservation	0.5% conservation for residential customers, ramping up to 1.5% in 5 years; 0.25% for commercial customers	$ 0.38
Water Conservation	1.00% conservation, ramping up to 2.5% in 5 years	$ 0.55
Gas Conservation	1.00% conservation, ramping up to 2.0% in 5 years	$ 0.26
Subtotal		**$ 1.19**
Avoided CIP		
Subtotal		**$ -**
Asset Management		
Solar Meter Installation Cost Avoidance	100% reduction	$ 0.02
Subtotal		**$ 0.02**
GRAND Total		**$ 3.30**

C. AMI System Operating Cost

Incremental operating costs related to AMI investments are primarily related to new staffing roles needed to: a) monitor and maintain hardware/software associated with the wireless network established to read advanced meters, b) analyze and utilize the large amounts of data that will become available through the AMI system, and c) optimally operate the electric, gas and water distribution systems. These staffing and other O&M costs are estimated at $1.9 million per year, in year 5 after installation.

Table 3: Listing of AMI Related Operating Cost ($1.9 million/year)

Cost Category	Annual O&M Cost ($ Million)
AMI Network, MDM Related Cost	
AMI Network Infrastructure, Software, and Professional Services	$ 0.12
MDMS and Professional Services	$ 0.23
Subtotal	**$ 0.34**
Electric Deployment/Maintenance	
Staffing	$ 0.41
Subtotal	**$ 0.41**
Water Deployment/Maintenance	
Staffing	$ 0.41
Subtotal	**$ 0.41**
Gas Deployment/Maintenance	
Staffing	$ 0.64
Subtotal	**$ 0.64**
Conservation Voltage Reduction	
Staffing & Professional Services	$ 0
Subtotal	**$ 0**
GRAND Total	**$ 1.9**

D. Summary of Cost-Benefit Analysis & Sensitivity Analysis of AMI Investment

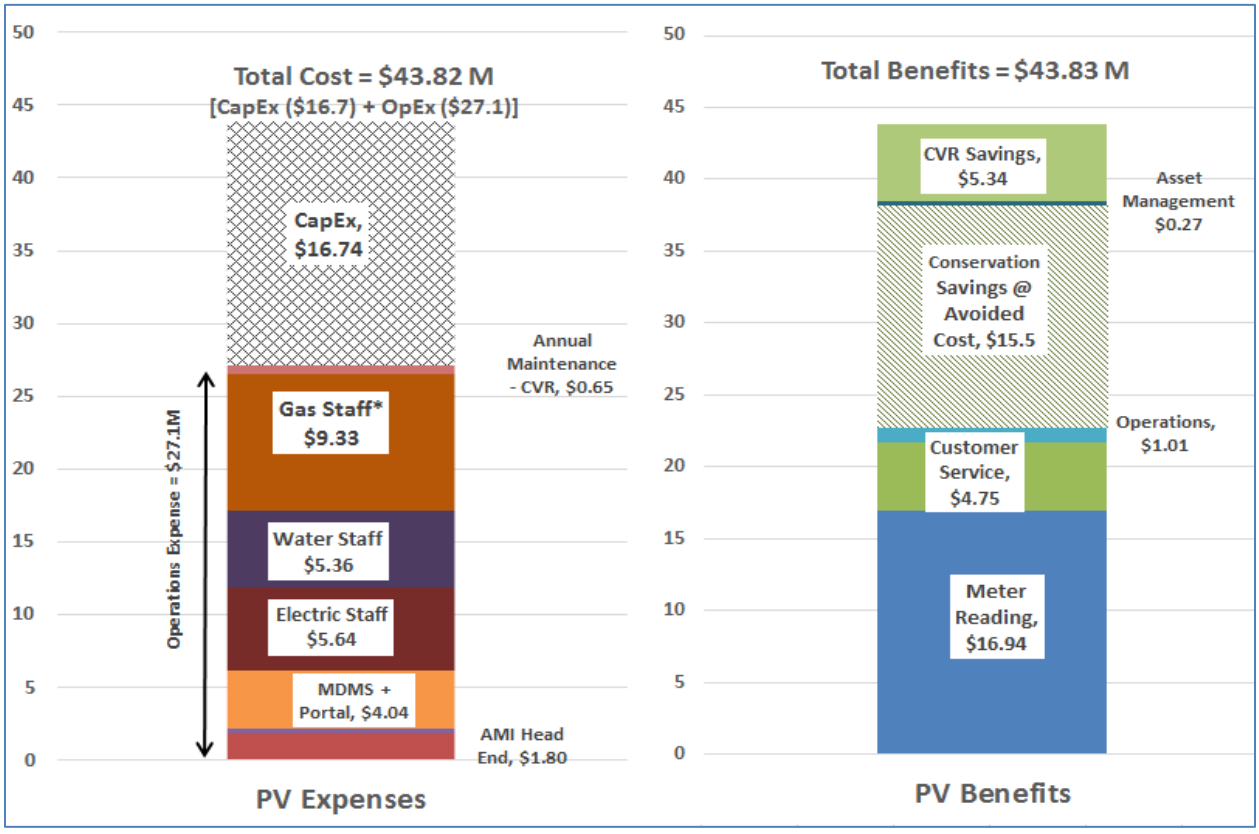
The business case employs a net present value (NPV) analysis methodology to compare the costs with monetized benefits. The NPV approach translates planned annual capital investments, ongoing annual operations and maintenance expenditures, and ongoing annual benefits into today's dollars.

The analysis computed the net present value (NPV) associated with the AMI investment over an 18 year period and found the investment, based on the cost and benefit assumptions shown in Tables 2 and 3 and described in more detail in the consultant's full report, to be near break-even over the life of the project. The analysis computed present value (PV) of operating cost and operating benefits over an 18 year period, and compared it with the initial capital cost, as shown in Table 4 below. The annual incremental operating cost in Year 5 after project completion was estimated at $ 1.9 million, and the corresponding PV of this cost over 18 years was estimated at $27 million. Similarly, the annual operating benefits associated with the AMI project were estimated at $3.3 million and PV over 18 years was estimated at $43.8 million. If these assumptions prove to be accurate, the resulting PV of net operating benefit of $16.8 million is close to the capital expenditure, making this project near breakeven on a NPV basis. This result is shown in Table 4 and illustrated in Figure 2.

Table 4: Summary Cost – Benefit Assessment for AMI Investment (NPV Analysis over 18 yrs)

Financial Metric	Base Case Results ($Million)
[A] Capital Expenditure	$ (16.74)
[B] Annual Operational Expense - Year 5	$ (1.90)
[C] Annual CPAU/Customer Operating Benefit - Year 5	$ 3.30
[D] Present Value of Operating Expenses (over 18 years)	$ (27.08)
[E] Present Value of Operatng Benefits (over 18 years)	$ 43.83
[F] Net Present Value (over 18 years) ([F]=[A]+[D]+[E])	**$ 0.01**

Figure 2: Present Value of Costs & Benefit of AMI Investment is Close to Break Even (PV over 18-years, $M)



*staff cost to be shared by water and natural gas funds, but shown here as allocated to gas

The NPV result of $0.01 million is dependent on numerous estimates[7] made in the analysis, particularly those related to staffing levels required to operate the AMI system, operational savings related to reduced manual meter reading process, and incremental customer energy/water efficiency and conservations savings achieved. As illustrated in the table 5 the NPV could range from an adverse $14.7 million to favorable $7.8 million over 18 years depending on whether the operational savings and efficiency estimates are achieved over multiple years. The base case estimates staffing synergies are achieved and 100% of the conservation goals (~2% reduction in utility consumption reduction over 5 years) are achieved.

Table 5: Sensitivity of NPV of AMI Investment ($M over 18 years)

		Conservation Goals Achieved		
		50%	100%	150%
Staffing Synergy Status	Achieved	($7.8)	$0.0	$7.8
	Not Achieved	($14.7)	($7.0)	$0.8

Besides offering the potential to provide operational and conservation savings, AMI is a strategic investment that is critical to meet customer expectations, enable new applications, and optimize utility operations. The following benefits were difficult to quantify and were not included in the financial model.

- Improved Customer Experience
- Improved Reliability
- Improved System Planning Capabilities
- Improved Asset Utilization
- Improved Water Resource Management
- Timely and Accurate Meter Reading
- New advanced retail rates
- Meter Right-Sizing
- Unauthorized Use and Tampering Detection
- Improved Safety and Reduced Workman's Compensation
- Compliance with Future Legislative Requirements
- Potential Grants to implement AMI

Overall, given the strategic nature of the investment, and including these intangible benefits, the analysis suggests that CPAU should plan, prepare and invest in an AMI based smart grid system.

[7] This investment analysis related estimates include the following: discount rate (3.5%), life of project (18 years), operating cost increase (3%), operational savings increase (1%), customer water use conservation (2.5%), customer natural gas use conservation (2%), customer electricity use conservation (1.5% residential, 0.25% commercial), conservation voltage reduction related energy conservation (0.5%), meter reading related staffing reduction (5 to 6 FTE), AMI related staffing increase (3 to 4 FTE). These estimates were based on industry experience and Palo Alto specific situations.

E. Policies and Procedures to Implement and Operate AMI based Utility System

Implementing AMI will impact many facets of the CPAU organization and customer interactions. In addition to early stage communication and feedback from CPAU staff and customers, operational policies and procedures must be evaluated and updated with UAC and Council input. A brief description of these operational areas and the corresponding sections under the current Rules and Regulations are listed below.

1. Discontinuance, Termination and Restoration of Service (RR 09): Need to include policy and procedure to remotely disconnect for electric meters. These policy changes will coincide with business process changes and the potential for allowing same-day and after-hours disconnects/reconnects.

2. Meter Reading (RR 10): CPAU will need to revisit the billing period of 27-33 days during re-engineering of business processes. If desired, this window can be condensed with AMI reads available daily. Also, abnormal conditions and bill estimation techniques may change with AMI/MDMS systems in place. CPAU must also consider whether the "Customer Reads Own Meter" Program will continue under AMI. New rules and fees related to customers who opt-out of the AMI meter installations on their premises will also have to be developed. In the event meter reads are not available over an extended period of time due to technology malfunction or cyberattack, an alternative customer billing process will also have to be defined.

3. Billing, Adjustments, and Payment of Bills (RR 11): Language related to theft needs to be reviewed and updated to accommodate AMI. Language related to water leaks at customer premises will have to be reviewed given that AMI has the ability to alert customers and CPAU about potential water leaks.

4. Meter Installation (RR 15). Sections related to meter seals, tampering, and meter testing will also have to be reviewed and updated.

Some policies may not be fully defined until AMI systems are selected and business process re-engineering are completed. These exercises will help inform which direction the policies will shift.

F. Coordinated Implementation with Technology Projects – Technology Roadmap

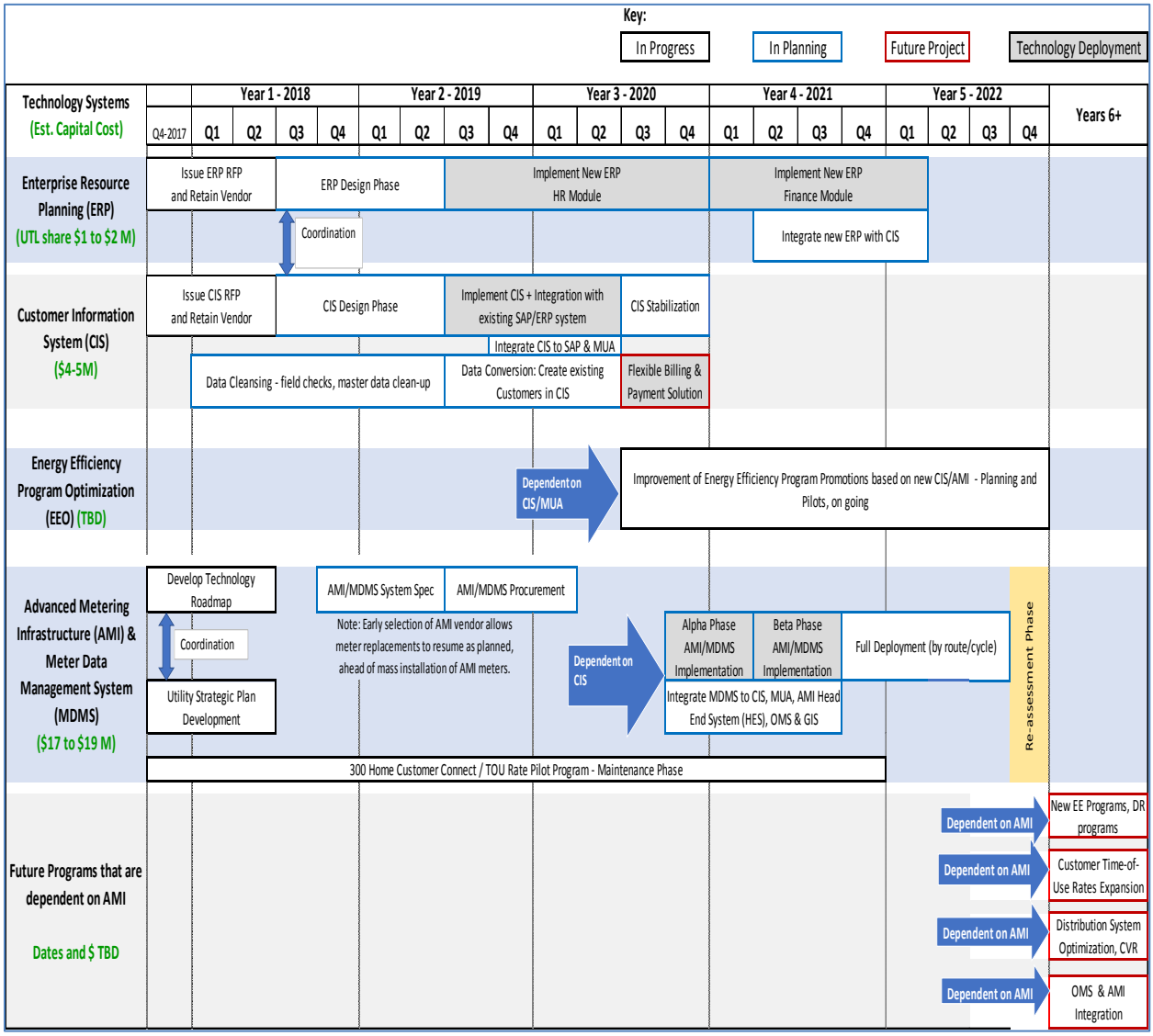
The technology road map is about CPAU's future technological capabilities and ensures that technology investments are aligned with CPAU's strategic plan. It sets the expectations for deliverables, time frames for development, complexity of the system, and the level of integration required. Several large scale technology projects are expected to be implemented in the 2018-2022 period, namely CIS, ERP and AMI. Proper planning and coordinated execution is critical for the successful implementation and operation of these projects. Management focus is required to ensure projects are properly sequenced and sufficient expert resources are made available to effectively execute on projects. In addition to numerous CPAU and IT department

staff involvement, the AMI project is expected to outsource meter installation, system integration and project management services to industry experts in their respective areas. The current AMI implementation timeline, developed in coordination with CIS and ERP project implementation timeline, is shown below.

- Develop AMI/MDM system specification & issue RFP to select vendor — Fall 2018
- AMI/MDM system vendor selection and procurement — Spring 2019
- MDM system implementation and integration with CIS completion — Spring 2021
- AMI meter installation completion — Summer 2022
- System Testing and Going Live with AMI based billing system — Fall 2022
- Leverage AMI system to enable other utility and customer programs — 2023+

Table 6 provides a coordinated timeline for implementing AMI, along with the CIS and ERP systems implementation.

Table 6: Timelines for Coordinated Implementation of AMI, with CIS and ERP Systems



While the mechanics of AMI implementation well understood[8], staff is particularly aware of the workload and coordination challenges related to implementing three major technology projects within five years. The timeline presented would be evaluated by the end of CY 2018 as the CIS project implementation makes progress.

G. Change Management & Staffing Resource Needs

Since AMI will transform many facets of utility operations and impact the customer communication channel and utility customer programs, proper planning and communication must be undertaken within the organization and with the community. AMI involves advanced applications, complex system integrations, and new business processes. It could impact hundreds of business processes at CPAU and will require staff to perform new tasks and develop different skill sets. Utilities will need to make adjustments to its hiring and training programs to ensure proper staffing with the right knowledge to deploy and operate the AMI network. Communicating the changes and helping staff understand the value of the new system is critical to a successful AMI deployment.

During the Utilities Strategic Planning (USP) engagement process in 2017, open conversations took place among staff members and the community which identified the need for an AMI system; hence, there is a high level awareness of the importance of AMI. CPAU and Human Resources have begun the process of identifying new training programs and evaluating alternate career path options within the organization for meter reading staff whose roles may largely be eliminated if AMI is implemented.

The analysis also identified the need for new staffing roles. These 3-4 new staffing roles include an AMI system technician, a data analyst, an AMI infrastructure maintenance technician, a CVR program maintenance engineer/tech, and an AMI program manager. Several of these roles are part-time roles that can be combined with other existing roles. The new roles will evolve and be defined at various stages of the project. During the 2-3 year implementation and system stabilization phase, temporary staff will be hired in the Utilities Customer Service center to temporarily backfill customer service reps that will be assisting on the project. Utilities will seek UAC and Council approval for these new positions during the annual budget process.

H. Community and UAC Input

During the USP development process in 2017, many community members and UAC Commissioners expressed the need for CPAU to invest in an AMI system. The 2018 USP identified the implementation of an AMI system as a key strategy under the Technology Priority to “Invest in and utilize technology to enhance customer experience and maximize operational efficiency.”

[8] CPAU’s consultant UWC has served as project manager on behalf of numerous utilities which have successfully implemented AMI. CPAU staff has also gained experience through the implementation of Palo Alto’s AMI pilot project and by learning from the experience of other utilities.

Staff presented the preliminary findings of UWC analysis at the November 1, 2017 UAC meeting[9]. The analysis concluded that AMI investment was essential for effective utility operations in the coming decade. In addition, the UAC Commissioners voted 5-1 to proceed with planning an AMI investment. This memo and accompanying consultant report seeks a formal recommendation from the UAC to Council to make the necessary investment to implement AMI.

Upon formal approval by Council, staff will begin a concerted effort to engage CPAU staff and the community to identify and address any lingering concerns they may have regarding such investment and resulting changes.

I. AMI Project Implementation/Operating Risks and Risk Mitigation Strategies

AMI systems are well proven technologies. They have been operating successfully in most California-based utilities and throughout the United States for about a decade. Hence, with many vendors offering AMI system products, the operating reliability risk associated with AMI technology is relatively low.

As of this assessment, 36 risks have been identified and categorized into 8 different types: budget, community, organizational change management, resources, schedule, scope, security, and technology. Each risk is assigned a risk impact (representing the potential impact of the risk, should the risk come to fruition) and a risk probability (representing the likelihood of the risk ever occurring during the course of the project), each of which is rated as "high", "medium", or "low". The combination of these two vectors generates a risk map, illustrating the priority of said risk. Outlined below are five of the top Palo Alto-specific risks, along with the associated mitigation steps:

1. Upcoming technology projects, particularly the CIS project, may compete for resources with the AMI project. Ensure adequate planning and resources so that the AMI project implementation and integration with the CIS happens well after the implementation of the CIS and after the new CIS system begins stable operations.
2. Poor staff engagement and communication, and lack of focused change management plans; external stakeholder communication will also be paramount. Communication will be made key area of focus during implementation.
3. Ill-defined vendor contracts will lead to improper level of configuration or missing integration. Consultant assistance will be sought in this area to minimize the risk.
4. Poor system integration to existing and future utility IT applications such as GIS, CIS, ERP, Asset management, OMS, etc. Organizational requirements gathering, planning and procurement management will be key to mitigate this risk. Clear vision of project milestone and key performance indicators need to be developed and accepted within organization.

[9] The preliminary analysis in November 2017 showed a NPV of negative $7 million. The updated analysis outlined here included additional efficiency/conservation benefits and synergies related to staffing AMI operations and maintenance, resulting in the NPV being estimated at $0.01 million. Currently this is the consultant's and staff's best estimate, within the uncertainty band outlined.

5. Lack of Council approved policies and protocols to effectively respond in the new technology environment. Examples include policies covering billing disruption, remote meter turn on/off, and mitigation of impacts caused by cyber-attacks. Ensure such policies are drafted with community input for Council approval.

NEXT STEPS

Upon UAC consideration and recommendation, staff will seek approval from Council. A tentative capital budget has been included in the FY19 budget for Council discussion and approval in June. The report would be brought for Council discussion in the summer.

If approved, consultants would be retained to assist with AMI system procurement (2018-19) and AMI implementation (2020-22).

RESOURCE IMPACT

The costs of these investments have been included in the proposed FY 2019 Capital Budget (Project EL-11014, Smart Grid Installation). The funding and major activities for the five years are outlined below.

AMI Budgets & Spending Timeline: A Pause in New Funding Needs in FY 2020 Assumed[10]

Fiscal Year	Funding	Major Activities
FY 2019	$1,000,000	Consultant assisted development of AMI/MDM system specifications in preparation for an RFP, issue RFP, sign contracts with MDM and AMI vendors for delivery in 2021 and 2022, respectively. In parallel, CIS implementation is beginning.
FY 2020	$0	Smart grid implementation on hold pending completion of CIS implementation. Assuming no additional funding needed in FY 2020. Water meter replacement project will be undertaken.
FY 2021	$3,000,000	MDMS system and AMI head-end software delivered; begin integration with CIS in January 2021. Alpha and Beta phase of testing with AMI meters.
FY 2022	$10,000,000	AMI meters delivered and mass installation begins. Complete integration with CIS.
FY 2023	$5,000,000	Complete meter installation, integrated system testing, go live.
TOTAL	$19,000,000	

[10] The schedule in Table 1 is based on the Technology Roadmap and assumes most funding is needed in FY 2021, FY 2022, and FY 2023. No additional funds would be needed in FY 2020 while CIS implementation is completed. The FY 2019 Capital Budget does not reflect this updated schedule, but it will be reflected in the FY 2020 Capital Budget.

The impact of these costs on each utility for the next 5 years is shown below.[11] The cost responsibility for the water and gas utilities is implemented through scheduled fund transfers to the electric fund, where the capital funds are budgeted.

Capital Budget Projections for AMI Project

	Electric	Gas	Water	Total
FY 2019	0.53	0.18	0.29	1.00
FY 2020	0.00	0.00	0.00	0.00
FY 2021	1.59	0.54	0.87	3.00
FY 2022	5.30	1.80	2.90	10.00
FY 2023	2.65	0.90	1.45	5.00
Total	***10.07***	***3.42***	***5.51***	***19.00***

While the Electric Special Projects (ESP) reserve is available to fund the electric portion of the investment, the Gas and Water Funds will have to cover their associated costs through reserves and rate adjustments. If the natural gas and water AMI investment funds are collected from retail rates in the short term, it may result in an adverse impact on customer retail rates. An alternate arrangement of funding the cost could be through an inter-fund loan from the ESP to the water and natural gas fund, with a loan repayment including interest over time. This alternate funding mechanism will be further investigated by staff and brought forward for UAC and Council consideration if feasible.

During the implementation and system stabilization phase, project management support would be provided by a consultant with experience in managing AMI project implementations. Collaboration with Northern California Power Agency (NCPA) is also under consideration. The series of major IT projects (CIS, ERP, and AMI) will require extensive staff time over the five year implementation period. At the peak of the project, nine to twelve FTE may be dedicated to the project. About half of the staff members focusing on the project will be business analysts whose full-time job is to implement IT projects. This means that any other major IT efforts aside from the ERP, CIS, and AMI systems will be deferred. Other staff focused on the project will be drawn from various Divisions of the Utilities Department, such as Customer Service, Operations, and Engineering to manage aspects of the project specific to their area of expertise. To minimize service impacts in those Divisions, some temporary staff will be brought on using the capital project budget listed above to reduce the service impacts resulting from redirecting staff who normally do not focus on IT implementation. The project may also result in increases in overtime, deferral of discretionary projects (for example, lower priority process changes or significant new rate designs might be deferred), and there may occasionally be some service impacts, such as small increases in call times or meter replacement times. Service levels will be

[11] Half of the common fixed costs of the project were allocated based on meter count, and the other half of the fixed costs were allocated to the electric utility, in recognition of the electric utility being the main driver for this investment. Based on the above allocation methodology, it is recommended that the $4.4 million in common cost related to project management, network installation and MDM/CIS integration be allocated to electricity, water and gas funds on a 70%, 14%, 16% basis respectively.

monitored, and if there are significant decreases in service quality, additional temporary staffing or consultant help would be used to reduce service impacts.

Post-implementation, three to four new permanent roles would be needed to operate and leverage the AMI system. This additional headcount would be off-set by the reduction in meter reader staff headcount. CPAU and Human Resources have begun the process of identifying new training programs and evaluating alternate career path options within the organization for meter reading staff whose roles may largely be eliminated with AMI implementation. Upon implementation of all three projects, the expectation is that there will be a net of one to two position reductions – though the overall staffing cost is projected to be higher due to the higher skill levels needed to manage the AMI system.

POLICY IMPLICATIONS

The recommendation conforms with the 2018 Utilities Strategic Plan (USP) that has identified implementation of AMI system as a key strategy under USP Priority#2 to "Invest in and utilize technology to enhance customer experience and maximize operational efficiency."

A number of policies to implement and operate an AMI system must be considered and approved at a later time. Such policies and procedures include fees that CPAU may need to charge customers that opt not to allow the installation of advanced meters at their homes, a backup customer billing process in the event AMI meters are cannot be read remotely due to a cyber-attack or a communication network interruption, as well as ways of managing other potential AMI operating issues.

ENVIRONMENTAL REVIEW

The Utilities Advisory Commission's recommendation to approve the investment in AMI system does not meet the definition of a project under Public Resources Code 21065; therefore, the California Environmental Quality Act (CEQA) review is not required.

ATTACHMENTS

- Attachment A: Smart Grid Assessment & Utilities Technology Plan - UWC Full Report
- Attachment B: Excerpts of the UAC Meeting Discussions on November 1, 2017

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